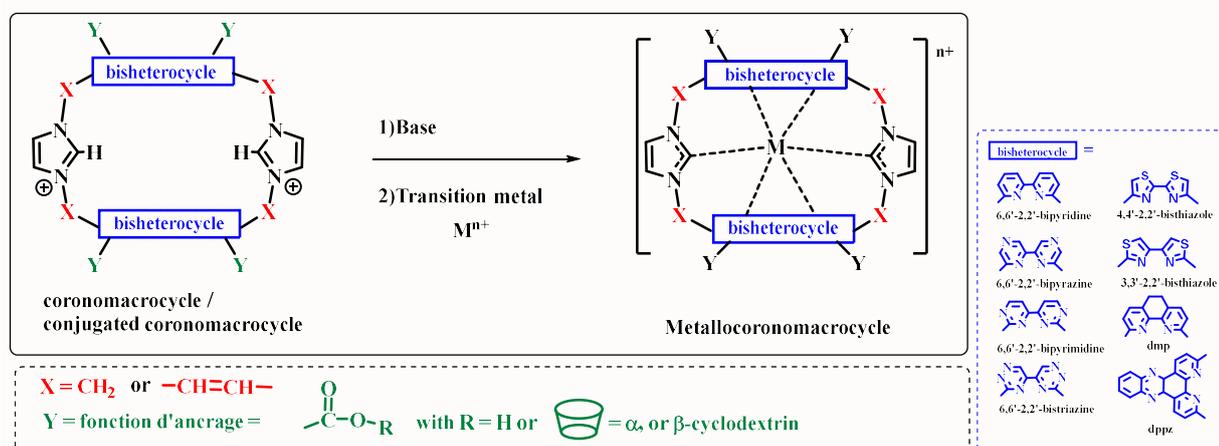


Master 2 level traineeship proposal

Syntheses of supramolecular photosensitizers with macro-bis-heterocyclic bis-imidazolium structure for phototherapy applications.

Background: This request is made in the context of the development of photoactive molecular systems for health, in particular for applications in phototherapy, opening the way to the treatment of many pathologies, including those of infectious and cancerous origin, using light.

Recent work carried out in the laboratory concerning the preparation of potential macro-*bis*-heterocyclic *bis*-imidazolium N-heterocyclic carbene (NHC) ligands [1], have shown interesting intrinsic photophysical and biological properties of these molecules, with a production of singlet oxygen ($^1\text{O}_2$), in yields of up to 84% for some of the macrocycles obtained. We wish to continue these syntheses in order to modify the structures and improve their photoactive properties with a shift towards higher wavelengths ($> 800 \text{ nm}$) in particular for applications in phototherapy. We aim at preparing structures with a higher conjugation but also a larger size allowing a better coordination of transition metals (e.g. Zn (II), Ag (I), Au (III), Pt (II), Fe (II)).



Objectives: The Master 2 subject will concern the **organic synthesis** of original N-macro-*bis*-heterocyclic carbene ligands and **the metal cation complexes** of the isolated compounds (scheme above), as well as their **characterization**.

Methodology: The candidate will perform **organic synthesis reactions** and **characterization** of the isolated molecules by classical physicochemical methods (Infra Red (IR), Nuclear Magnetic Resonance (NMR), mass spectroscopy, microanalysis, etc.). The study of their **coordination properties** will then be carried out. Depending on the progress of the synthesis, the analysis of the photo-physical properties (fluorescence, $^1\text{O}_2$, photoacoustics) and the application in biology (cytotoxicity, antimicrobial/antiviral properties, antiproliferative) will then be discussed in collaboration with Dr. Mihayl VARBANOV.

Desired profile: The candidate should have a strong knowledge in **organic synthesis methodology** and **coordination chemistry**. He/she should have the necessary knowledge of physico-chemical analysis (IR, NMR, mass spectroscopy, microanalysis). Good knowledge in biology is welcome. For international candidates, a good command of English is sufficient (a good knowledge of French would be appreciated).

Application: Applications should be sent to Florence Dumarçay (florence.dumarcay@univ-lorraine.fr) and must include a CV and the transcript of records of BSc and MSc levels.